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——————Book Review——————

William C. Wimsatt, *Re-Engineering Philosophy for Limited Beings* (Harvard University Press, 2007, 472p.)

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A good word to describe Wimsatt's book would certainly be messiness. But this is not meant as a negative critique. Wimsatt's central interest is the messiness of our world and of our ways to understand it. This is reflected in the complexity of the analysis offered here. The thirteen chapters form a rich web of interconnected concepts, which are expounded in different contexts to help an understanding of their different meanings. This book, which is a collection of articles written during Wimsatt's long career, offers a very original philosophical perspective on the sciences.

By focusing on messiness and complexity, Wimsatt departs strongly from what most philosophers of science have been doing until relatively recently. Indeed, he rejects the mainstream philosophy of science for different reasons. First, from an epistemological point of view, he criticizes the idealizations philosophers have constantly made in their descriptive and normative discourses about science. Second, from an ontological point of view, he wants to replace Quine's desert ontology with what he calls "a tropical forest" ontology.

The book is structured in four parts. The first two are essentially devoted to methodological issues. The third part deals with the ontology of complex systems and its consequences for scientific approaches — mainly reductionist strategies. The last part is partly autobiographical and throws interesting light on Wimsatt's intellectual journey, which has lead him to recognize how essential the practical dimensions of science are.

There are many ways to travel through this original philosophical landscape. One important starting point is the full recognition that human beings are limited in their cognition, inferences, computation, representation, and so on. Taken seriously, this must lead to a rejection of what he calls "the myths of LaPlacean omniscience" that form the tacit assumptions inherited from logical empiricism. According to Wimsatt, many problems have arisen because of these highly idealized accounts of science and the cure should come from a careful analysis of scientists' real practice. Wimsatt thus tries to build a more naturalistic philosophy of science. Naturalism has been proclaimed by many philosophers in the recent past, but according to Wimsatt their naturalism was

not naturalistic enough.

Wimsatt's exploration of real science has convinced him of the importance of errors and heuristics. In this new picture practical problems of scientific methodology and heuristics become much more important than *in principle* claims (i.e. what could be done in an idealized science, without computational limits or with perfectly rational agents). Our scientific strategies are full of errors and biases, but contrary to some philosophers, Wimsatt does not think that this should lead us to endorse a kind of relativism. He is fascinated by how scientists are so often successful despite having to work with unreliable methods. The answer to this puzzle is to be found in the study of heuristic techniques. Studying heuristics instead of axioms and rigid logical structures gives a much more dynamic view of science. For example, in chapter six, by carefully analyzing a famous episode in the constitution of classical genetics, Wimsatt shows how the use of deliberately false models can be a very powerful tool in the search for better theories.

The key concept for reconciling faillibilist methods and realism is *robustness*. This is where methodology and ontology meet. Defined as "the use of multiple independent means to detect, derive, measure, manipulate, or otherwise to access entities, phenomena, theorems, properties, and other things we wish to study" (p.37), robustness constitutes the most important criterion for reality and for identifying artifacts. This idea is quite simple: each way to access an entity is certainly not completely reliable, but when independent methods (and they should be truly independent, which is something difficult to determine in real cases) detect the same entity, it is then highly improbable that it is only the result of a bias in our methods.

This criterion for reality has many important consequences for ontology. First, this leads to a local realism instead of a global one, because each method works only locally. The second consequence is a rich ontology, because the criterion of robustness forces us to recognize entities at many different levels. Wimsatt offers an in-depth discussion about the ontological structure of the world. He devotes many pages to the notion of *levels of nature* (especially in chap. 10), which is the fundamental structure in his account. But levels do not exhaust the structure of the world. He defines two other kinds of entities: *perspectives* and *causal thickets*. It is of course not possible to describe here in detail how these entities are conceived by Wimsatt, but the important point is that this ontology has further consequences. In this complex world, we have several ways of decomposing systems,

and each has a kind of autonomy. Many problems are not only multi-level but also multiperspectival, which means that no perspective is sufficient in itself. However, when we put these perspectives together we have to face what Wimsatt calls "the problem of conceptual coordination": how to articulate and integrate our partial theories. This is not an easy task and this often leads to misleading decomposition and articulation of systems. Realism plays a central role here, because one essential requirement to achieve the integration of these different views is to assume that they have a common referent. It is remarkable how Wimsatt insists on the fundamentally fragmentary nature of our worldview but without accepting any relativist conclusion.

The concept of levels is closely linked to those of emergence and reduction, which are discussed in several chapters of the book (mainly in chap. 11 and 12). But in Wimsatt's framework the problem of reductionism looks very different from how it has been discussed traditionally. Reduction is not defined in terms of formulating logical or deductive connections between levels understood as linguistic entities. Wimsatt is interested in how scientists study and decompose complex systems, and thus in reductionist strategies. He is one of the first philosophers of science who advocated a mechanistic framework to think about relations between levels. His definition of a reductive explanation is a causal one: "a reductive explanation of a behavior or a property of a system is one that shows it to be mechanistically explicable in terms of the properties of and interactions among the parts of the system." (p.275)

The concept of reductive explanation defended in this book not only strongly rejects any form of eliminativism, but also shows the limits of purely functionalist approaches, because it is necessary to take into account lower-level mechanisms in order to better characterize and explain higher-level phenomena. It gives a complex picture in which each level constrains other levels and theories at different levels follow a kind of co-evolutionary process. This analysis of the inter-level mechanistic model construction has opened the way for a rich tradition in the last twenty years (see for example the work of William Bechtel, Robert Richardson, Lindley Darden, and Carl Craver). Wimsatt's position on this issue is interesting because he defends a kind of reductionism that recognizes the uneliminability of upper-level entities and avoids the fallacy of "nothing but-*ism*".

What is perhaps the most important contribution of Wimsatt's work for the

philosophy of science is his idea that we should completely change the models we use to think about the sciences. It is well known that logical empiricists almost entirely focused on physics, which was seen as the paradigm for all the sciences. Wimsatt early on started to think seriously about biology, not only for the specific philosophical problems it raises (this corresponds to the regionalization of the philosophy of science, which started in the 1970's), but most importantly as a model for a general philosophy of science. Together with engineering (Wimsatt's original specialty), biology (especially evolutionary biology) provides a fertile source for understanding the world and the methods we use to understand it. First, it gives a more realistic idea of how most sciences are practiced: "Engineering shows—writ large—the robust pragmatic realism and other heuristic elements permeating methodology *as practiced in all sciences* but often obscured in their more formal statements." (p.315) In a complete reversal, instead of considering fundamental sciences, like physics, as *the* paradigm for understanding all the sciences, Wimsatt sees them as special cases. Second, reasons and rationality, our bodies and minds, are engineered objects, in the sense that they are the results of evolutionary processes. Looking at them from that point of view will bring completely new insight to philosophers as well as to scientists. Here Wimsatt has followed the paths opened in the 1950's by people like Herbert Simon and Donald Campbell.

In summation, this is an extremely dense book, full of many original and provocative ideas. This is of course not to say that all of these ideas are unproblematic, but these difficulties cannot be discussed here. Some chapters are certainly quite difficult to read and the reader will sometimes wonder if Wimsatt could not have formulated some arguments with more clarity. But this certainly reflects an essential aspect of Wimsatt's thinking—his fertile mind exploring with great excitement many directions at the same time. Several important philosophers have been inspired by Wimsatt's work and are now exploring similar issues, but there is still more to find in it and there is little doubt that this book will continue to stimulate many other thinkers.